PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Bushings

We, ILLINOIS TOOL WORKS INC., a corporation organised under the laws of the State of Delaware, United States of America, of 8501 West Higgins Road, Chicago, Illinois 60631, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

According to this invention a resilient bushing, for use between an elongated rod-like member and an aperture in a support member comprises a shank, a laterally extending head adjacent one end of the shank, one or more external shoulders on the shank facing the head, a bore extending through the head and the shank, a plurality of resilient strap-like members, arranged in chordal positions within the bore, attached at their opposite ends to the bushing, and angularly spaced around the bore, the bushing being shaped to engage the support member in a manner to prevent rotation of the bushing relatively to the support member.

Further features which are preferred but not essential will be described in the course of the following description of one example of a bushing embodying the invention, shown in the accompanying drawings, in which: —

Figure 1 is a perspective view in partial section of an installation of a bushing, as viewed from the shank end of the bushing;

Figure 2 is a perspective view in partial section of the bushing of Figure 1 as viewed from the head end of the bushing;

Figure 3 is an elevation of the bushing of Figure 2 as viewed from its head end;

Figure 4 is an elevation in partial section as viewed along line 4—4 of Figure 2;

Figure 5 is a side view of the bushing as viewed along line 5—5 of Figure 1; and

Figure 6 is an exploded perspective view of a typical installation utilizing a plurality of bushings and work supports and showing such bushings in various stages of installation.

Referring now to the drawings, a bushing 10 includes a shank 12, a head 14 and rotation preventing means 16. The bushing is mounted in a support member 18 and adapted to support a complementary rod 19 or like member. The support member 18 is preferably made of rigid sheet material, and is provided with a keyhole aperture 20 having a circular portion 22 spaced from an edge of the member 18 and communicating with that edge by means of a slot 24, for purposes described below.

The shank 12 is externally tapered from adjacent its juncture with the head 14 and is provided with a through bore 26 which traverses both the shank 12 and the head 14. A plurality of external shoulders 28 are positioned on the shank 12 and terminate in abrupt faces which are in opposed spaced relation to the under-surface of the head 14. The shoulders 28 are preferably tapered at one end in the same direction as the taper of the shank 12 to facilitate insertion in the workpiece. In the present example, two such shoulders 28 are shown, but the exact number is a matter of choice. Additionally, the shoulders 28 could be of greater circumferential extent than shown, as for example provided by a circumferentially extending groove in the shank adjacent to the head. To facilitate radial assembly of the bushing with the rod 19, the bushing 10 is provided with an axial split 32 which extends throughout its entire axial extent. The bushing 10 can be expanded by opening the split 32 to an extent sufficient to accept the diametral measurement of the rod 19, and thereafter contracted

to fit the aperture 20, as more clearly described below.

The head 14 is a laterally extending flange at one extremity of the shank 12 and may be discontinued at spaced circumferential points. At a location opposite the split 32, the head is relieved to provide a hinge section 34 running along the axial extent of the shank 12. Further relief of the head 14 takes place at points 36 which are axially aligned with the shoulders 28. The bushing is preferably injection moulded from thermoplastics material such as nylon. The discontinuities 36 facilitate the moulding of the bushing in a two-plate injection mould. Further, the discontinuities 36 contribute to the flexibility of the head section, particularly at the peripheral location of the shoulders 28, and thereby facilitate assembly of the bushing within the aperture.

Internally of the bushing and extending axially within the through bore 26 are a plurality of circumferentially spaced resilient strap-like members 40 which are integrally attached at their opposite ends to the inwardly facing surface of the bore 26. The members 40 are chordally arranged so that their opposed surfaces are at a predetermined diametral spacing, for purposes described below.

The rotation preventing means 16 includes lateral extensions 44, in the same plane as the head 14, and two flanges 46 extending laterally from the shank 12, with the flanges 46 at their extremity lying in a plane substantially parallel to the axis of the bushing. Their outer surfaces are tapered in the same direction as the taper of the shank 12 for purposes described below.

The bushing is initially moulded in a partly open condition as shown in Figure 3 to facilitate the assembly of the bushing with the rod 19. When the bushing is circumferentially compressed by closing the split 32, an imaginary cylinder coincident with the axis of the bushing and having a circumference tangential with the chordal members 40 will preferably be substantially equal to or slightly smaller in diameter than the diameter of the rod 19 with which the bushing is to be ultimately associated.

An assembly using the bushing normally includes two or more support members 18 mounted in spaced relation on a common work structure 50 with the slot 24 communicating with an edge of each support member 18 spaced from the work structure 50. The rod 19 is generally moved perpendicular to its axis as indicated by the arrows "A" through the slots 24 of the keyhole apertures 20 until such time as the rod 19 is positioned within the circular portion 22 of the apertures. Bushings 10, equal in number to the members 18, are moved radially in the direction of the arrow "B" as seen in Figure 6. It should be noted that in normal practice the arrow "B" could be in any convenient direction, such as the direction shown by arrows "A", but for clarity of illustration it is shown in its present position. After each bushing has been mounted on the rod 19, it is compressed by flexing about its hinge point 34, as indicated by the direction of the arrows "C", by suitable means such as special pliers, not shown, and is then moved axially in the direction of the arrows "D" into telescopic relation with the respective keyhole aperture 20 with the flanges 46 oriented within the slot 24. The external tapering surfaces on the shank 12, the shoulders 28 and the flanges 46 assist the entering of the bushing 10 within the keyhole aperture 20, while the members 40 flex against the substantially non-compressible shape of the rod 19. The axial movement of the bushing 10 is continued until the under surface of the head 14 bears against the one side of the support plate 18 and the faces of the shoulders 28 bear against the opposite surface thereof. As can be appreciated, this technique facilitates the mounting of a rod 19 within apertured support plates, particularly in those instances where the rod 19 includes a bent portion 56 or additional means 58 mounted on and intermediate the extremities of the rod 19.

In the event that the keyhole apertures 20 in the support members 18 are not in registry along a common axis, the members 40 are sufficiently resilient to accept an off-centre rod 19. Additionally, in the event that the diameter of the rod 19 has a variation in its tolerances, it too will be accepted within the resilient members 40. The resilient members 40 within the bore 26 additionally serve to act as a brake to exert resilient restraint on rotation of the rod 19.

Thus with the bushings a rod-like member 19 can be readily mounted in spaced support members 18 and successfully utilized to carry out various functions which previously required expensive and complex arrangements.

WHAT WE CLAIM IS:—

1. A resilient bushing for use between an elongated rod-like member and an aperture in a support member, the bushing comprising a shank, a laterally extending head adjacent one end of the shank, one or more external shoulders on the shank facing the head, a bore extending through the head and the shank, a plurality of resilient strap-like members, arranged in chordal positions within the bore, attached at their opposite end to the bushing, and angularly spaced around the bore, the bushing being shaped to engage the support member in a manner to prevent rotation of the bushing relatively to the support member.

2. A bushing as claimed in claim 1, where-

in the shank and the head are axially split so that the bushing is circumferentially expandable and contractable.

3. A bushing as claimed in claim 2, in which the head is an interrupted flange extending outwardly from one extremity of the shank, with interruptions at points in opposition to the shoulders and at a point diametrically opposite to the split, this latter interruption adapted to permit circumferential flexing of the bushing.

4. A bushing as claimed in claim 2 or claim 3, for use with a support member having an aperture which is keyholed in configuration and which opens laterally through one edge of the support member, in which the shape to prevent rotation between the bushing and the support member is provided by integral laterally extending portions positioned adjacent the split and adapted to engage the slot portion of the keyhole aperture.

5. A bushing as claimed in claim 4, wherein the laterally extending portions comprise two flanges which taper as they extend from the head so as to progressively close the split when they are introduced between the opposite flat wall portions of tht keyhole slot.

6. A bushing as claimed in any preceding claim in which the external surface of the shank tapers as it extends from the head.

7. A bushing substantially as hereinbefore described with reference to the accompanying drawings.

8. An assembly of a rod-like member in the bore in one or more bushings as claimed in any preceding claim, the bushing or bushings being mounted in a keyhole aperture or in keyhole apertures respectively in one or more support members.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1

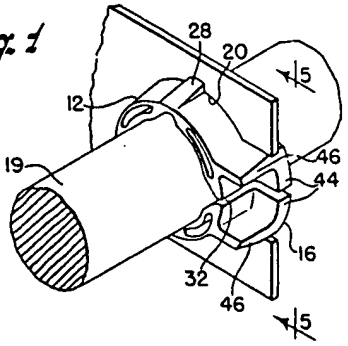


Fig. 2

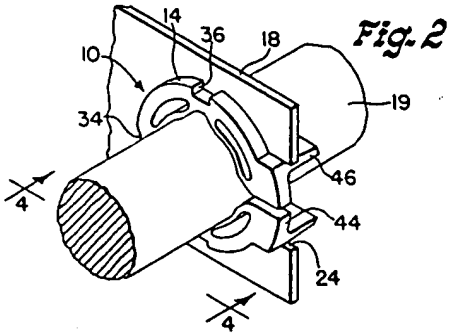


Fig. 3

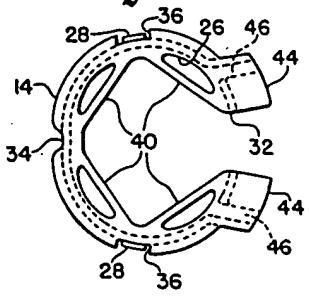


Fig. 4

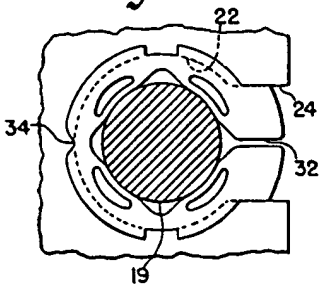
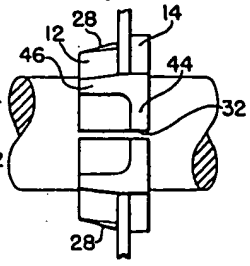


Fig. 5



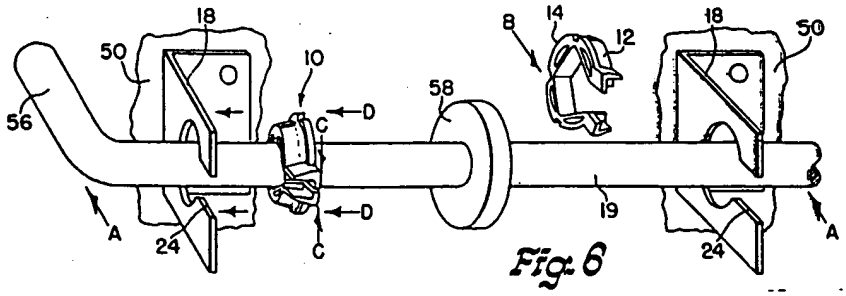


Fig. 6